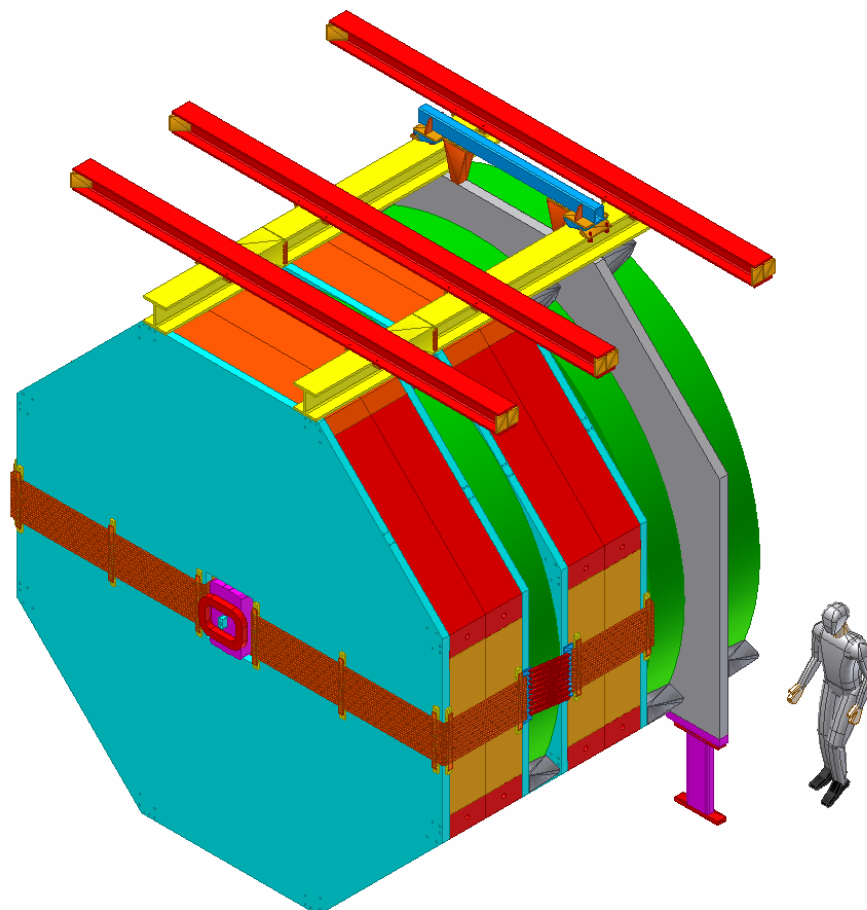




BTeV Muon (WBS 1.5)

Paul Sheldon ~ Vanderbilt University



■ Illinois

- Mats Selen
- Jim Wiss
- Doris Kim
- Mike Haney
- Vaidas Simaitas

Legend:

Engineer
Faculty
PostDoc
Technical

■ Puerto Rico

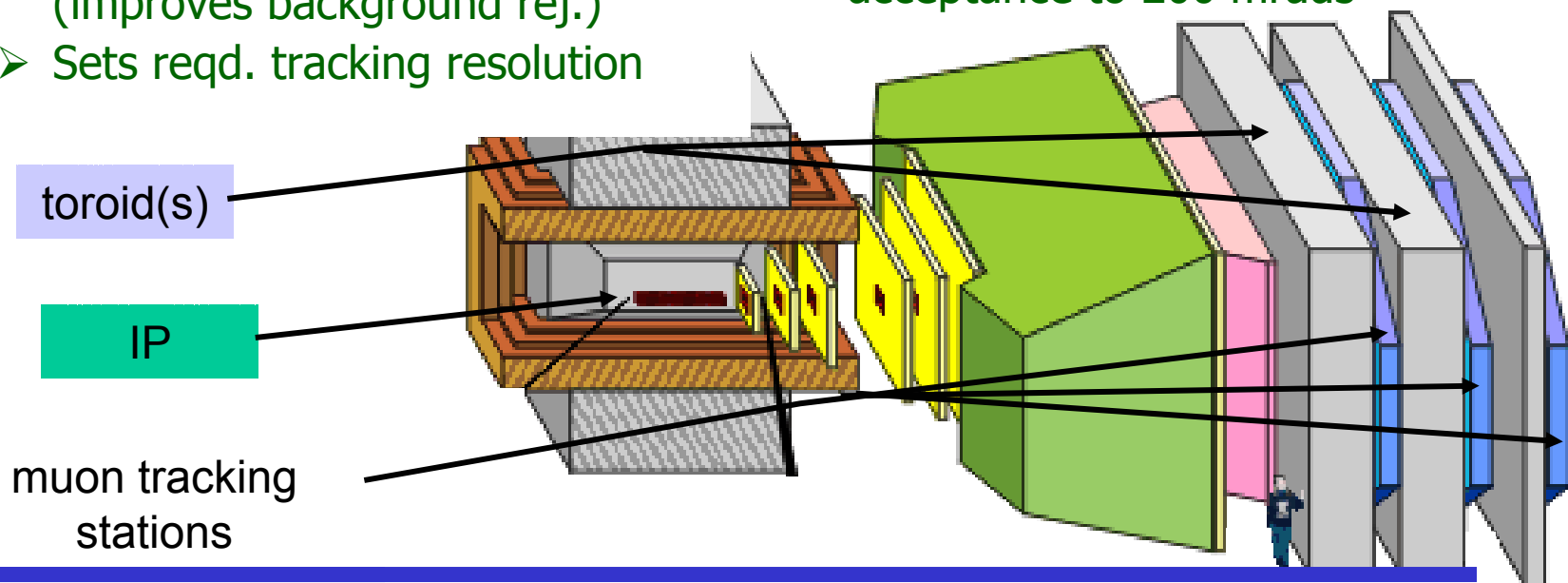
- Angel Lopez
- Hector Mendez
- Eduardo Ramirez
- Zhong Chao Li
- Aldo Acosta

■ Vanderbilt

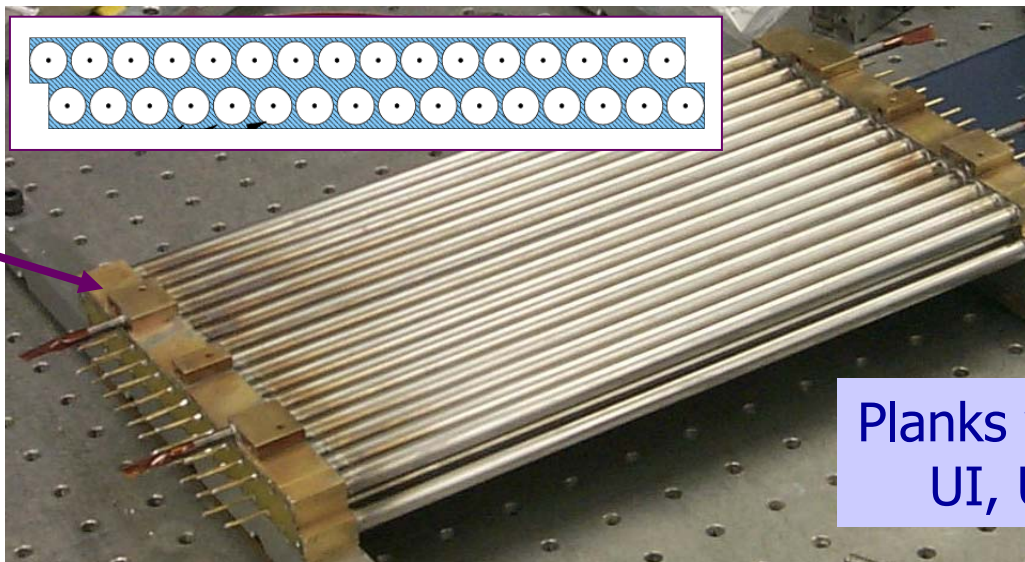
- Will Johns
- Paul Sheldon
- Med Webster
- Eric Vaandering
- John Fellenstein

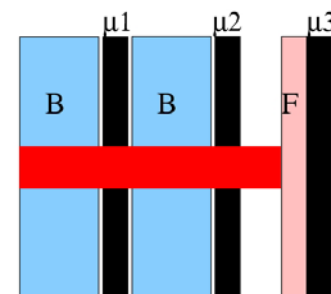


- Provides Muon ID and Trigger
 - Trigger & ID for interesting physics states
 - Check/debug pixel trigger
- Fine-Grained tracking + toroids
 - Stand-alone mom./mass trig.
 - Momentum “confirmation” (improves background rej.)
 - Sets reqd. tracking resolution
- Other design goals/constraints:
 - Min. pattern recognition confusion
 - Minimize occupancy
 - Distribute occupancy uniformly
 - Minimize max. drift time
 - Robust, high-rate detector element
 - Size of hall limits wide-angle acceptance to 200 mrad



- Basic Building Block: Proportional Tube “Planks”
 - 3/8” diameter Stainless steel tubes (0.01” walls)
 - “picket fence” design
 - 30 μ (diameter) gold-plated tungsten wire
 - Brass gas manifolds at each end (RF shielding important!)
 - Front-end electronics: use Penn ASDQ chips, modified CDF COT card
 - Likely to use 85% Ar - 15% CO₂ (no CF₄)

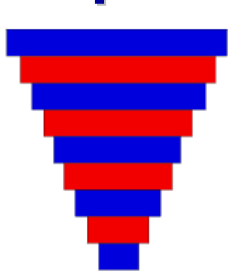




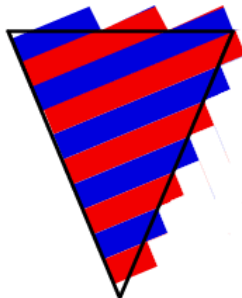
■ Meets design goals/constraints:

- Min. pattern recognition confusion
- Reduce occupancy
- Distribute occupancy uniformly
- Minimize max. drift time
- Robust, high-rate detector element
- Stand-alone momentum/mass trigger
- Momentum “confirmation” (improves background rejection)
- Meets reqd. tracking resolution ($< 2\text{mm}$)

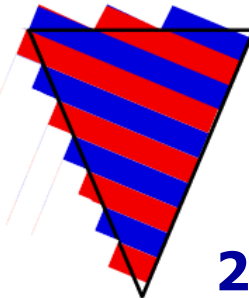
12 planks “cover” each octant



r

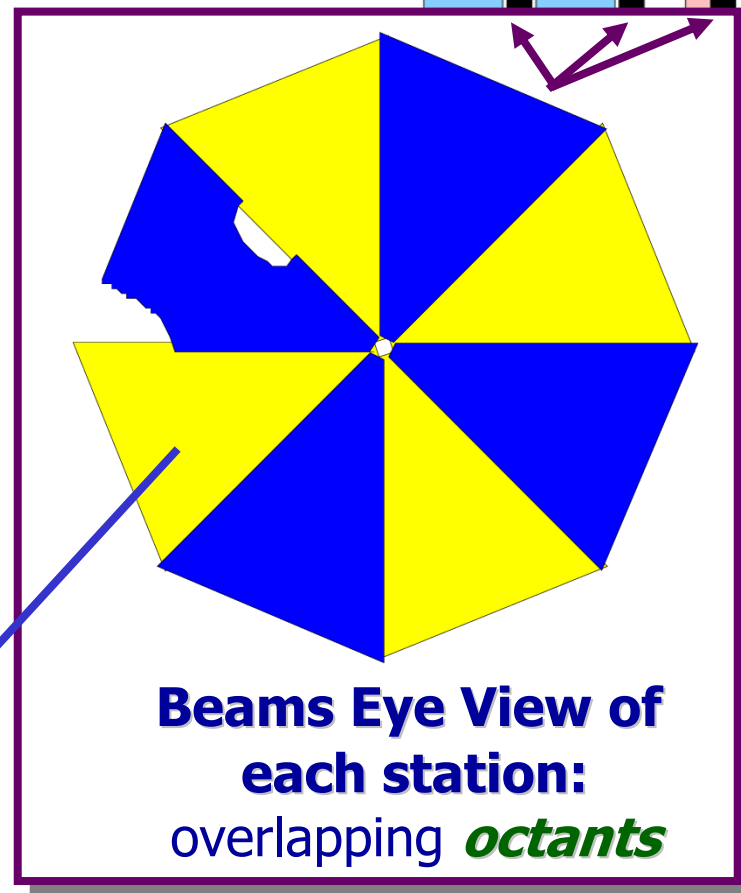


u



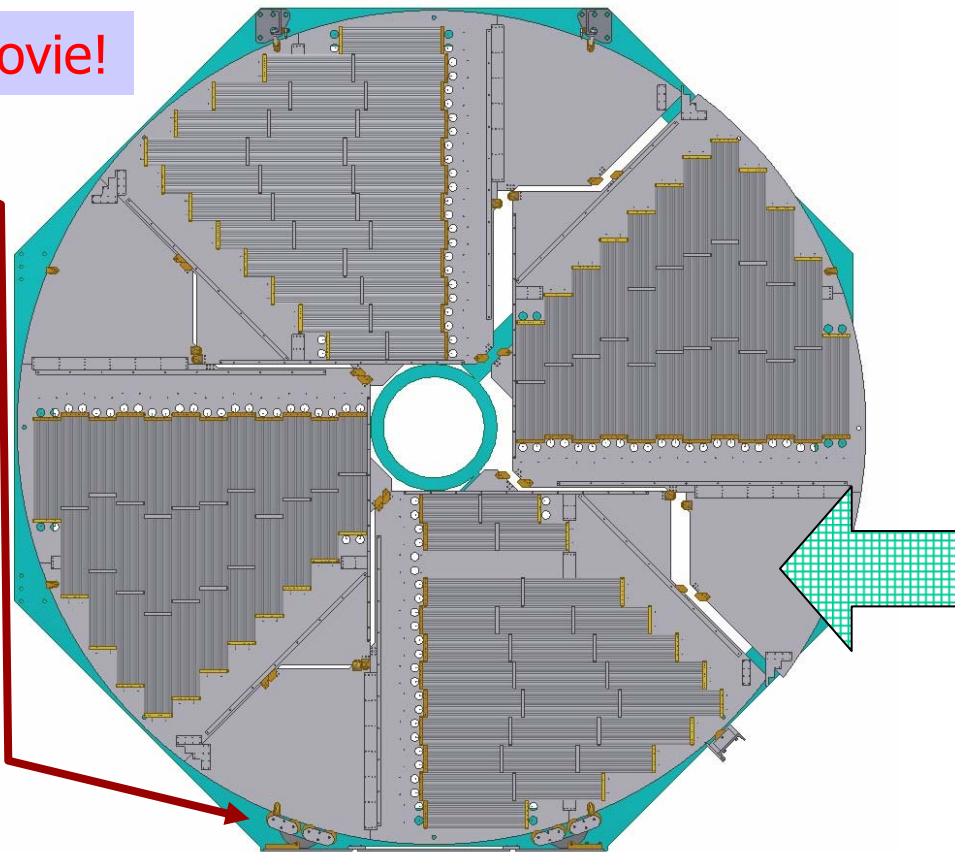
v

**2 stereo views provide ϕ info.
4 views per station (r, u, v, r)**

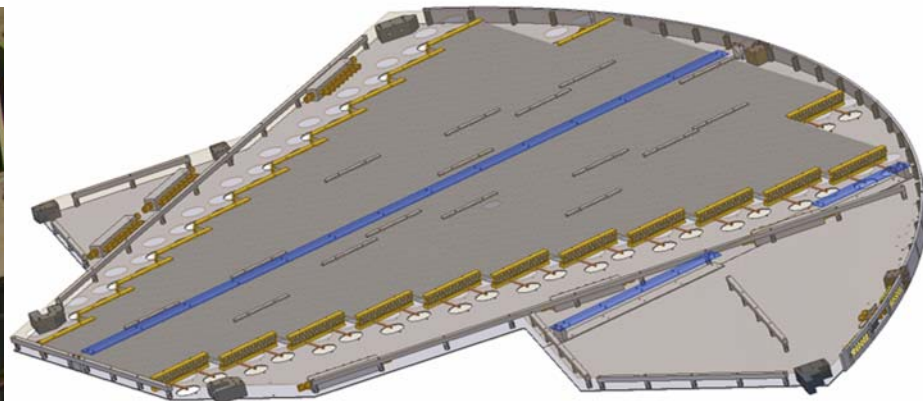


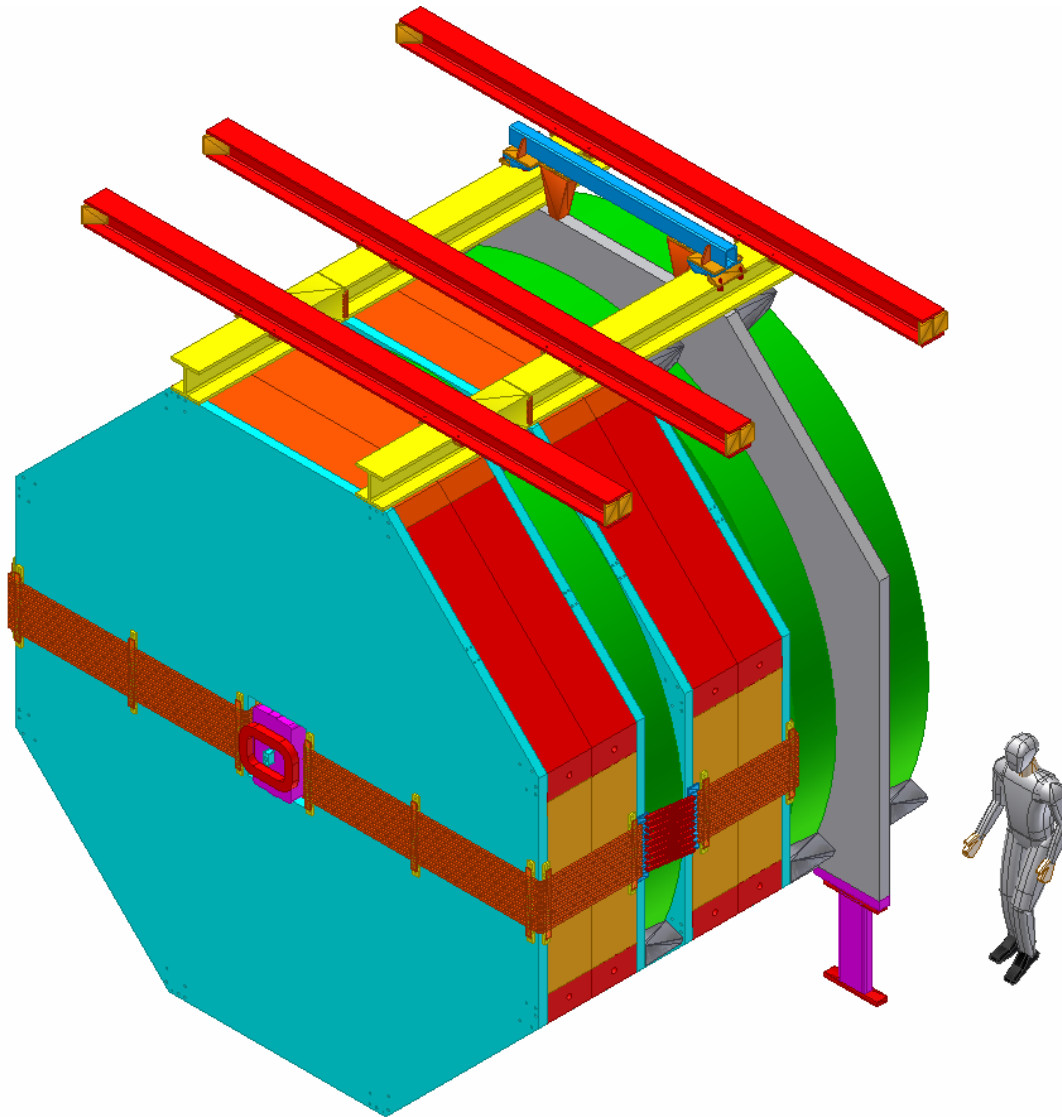
**Beams Eye View of
each station:
overlapping *octants***

- 4 *octants* make a wheel, two wheels construct a view.
- Octants will be built at institutions and delivered to FNAL.
- "Vertical Lazy Susan" **See movie!** installation - rotate during installation on floor rollers
- Each wheel will then be hung vertically from overhead beams. (picture later)
- This allows each view to be individually serviced: it will be possible to install and/or remove an octant during run.
- Each octant is installed in wide aisle horizontally.



U - stereo wheel plates.

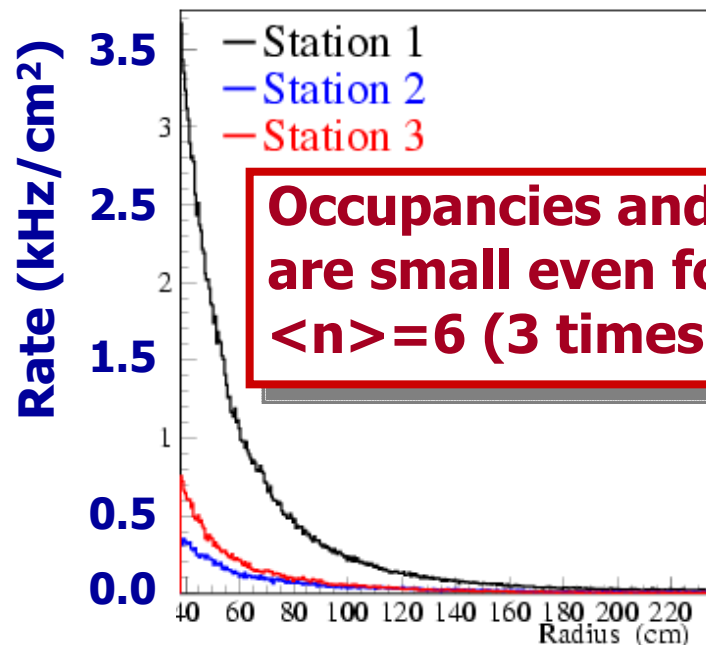
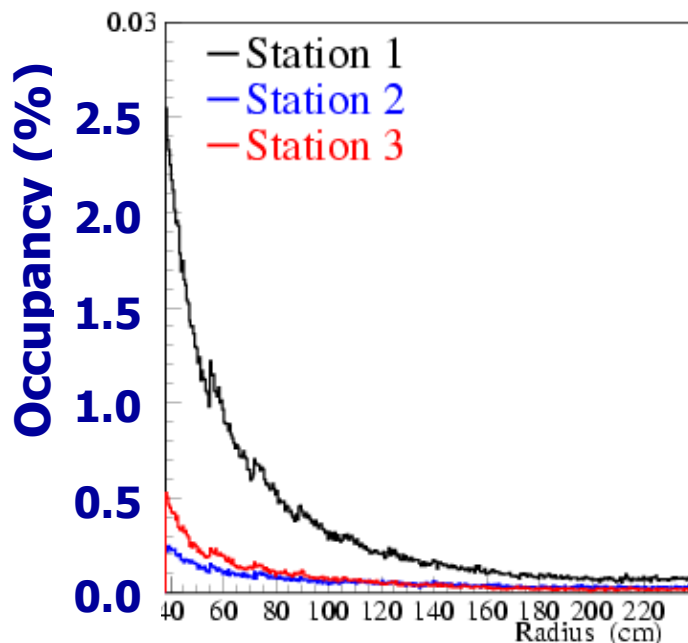




- The entire muon **system** can move with the toroid package since there are no floor connections.
- The wheels are supported from individual floor rollers during installation and then hung vertically from the overhead beams.

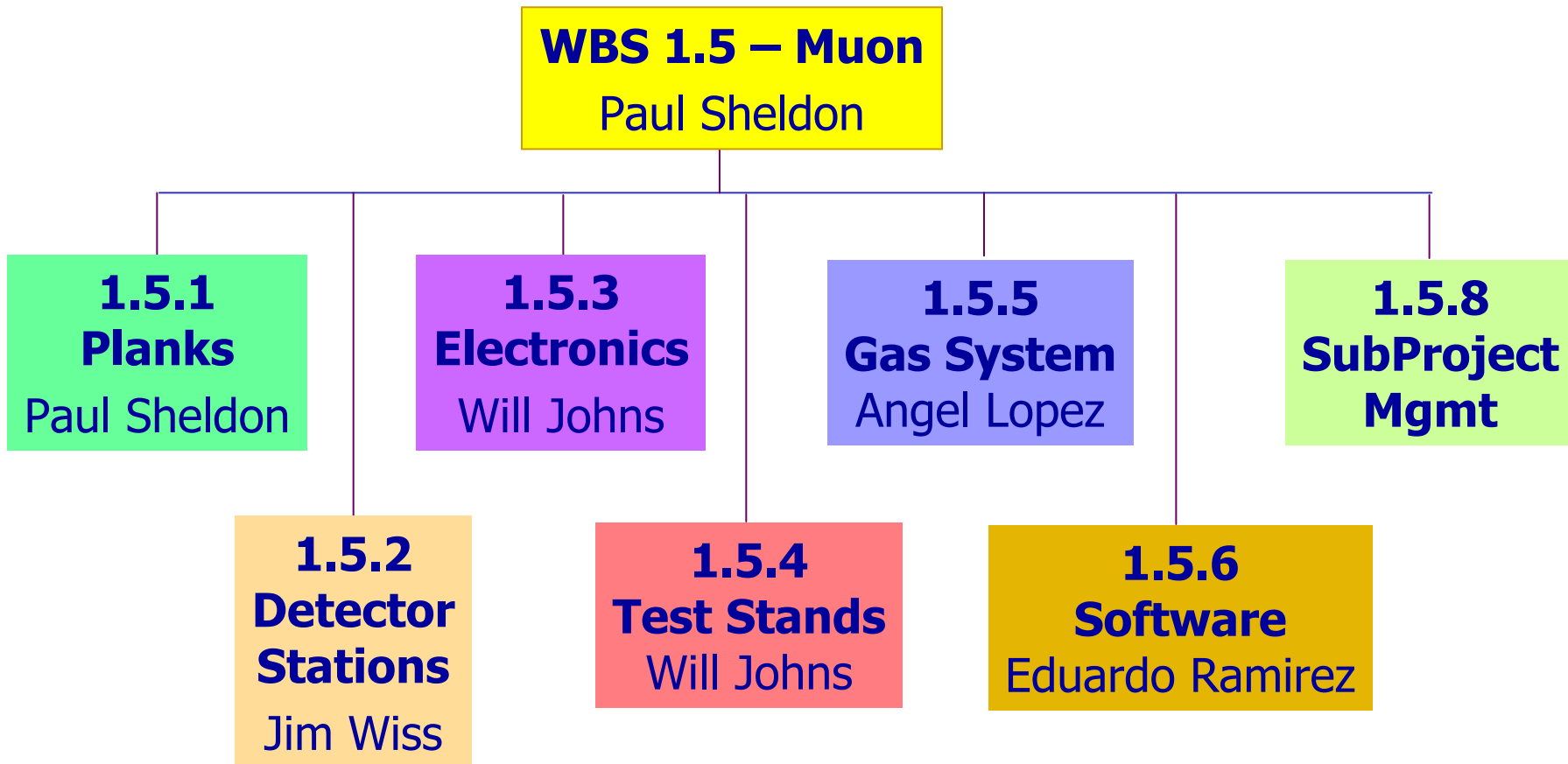
- Minimum bias events will be largest source of hits in detector
- Generated assuming an average of 2 interactions/crossing
 - Updating these studies now...

What	Station 1	Station 2	Station 3	Total
avg. # of hits per crossing	42	8	9	54
avg. occupancy	0.34%	0.06%	0.07%	0.15%
max. channel occupancy	2.50%	0.24%	0.52%	
max. channel rate (kHz/cm ²)	3.7	0.4	0.8	



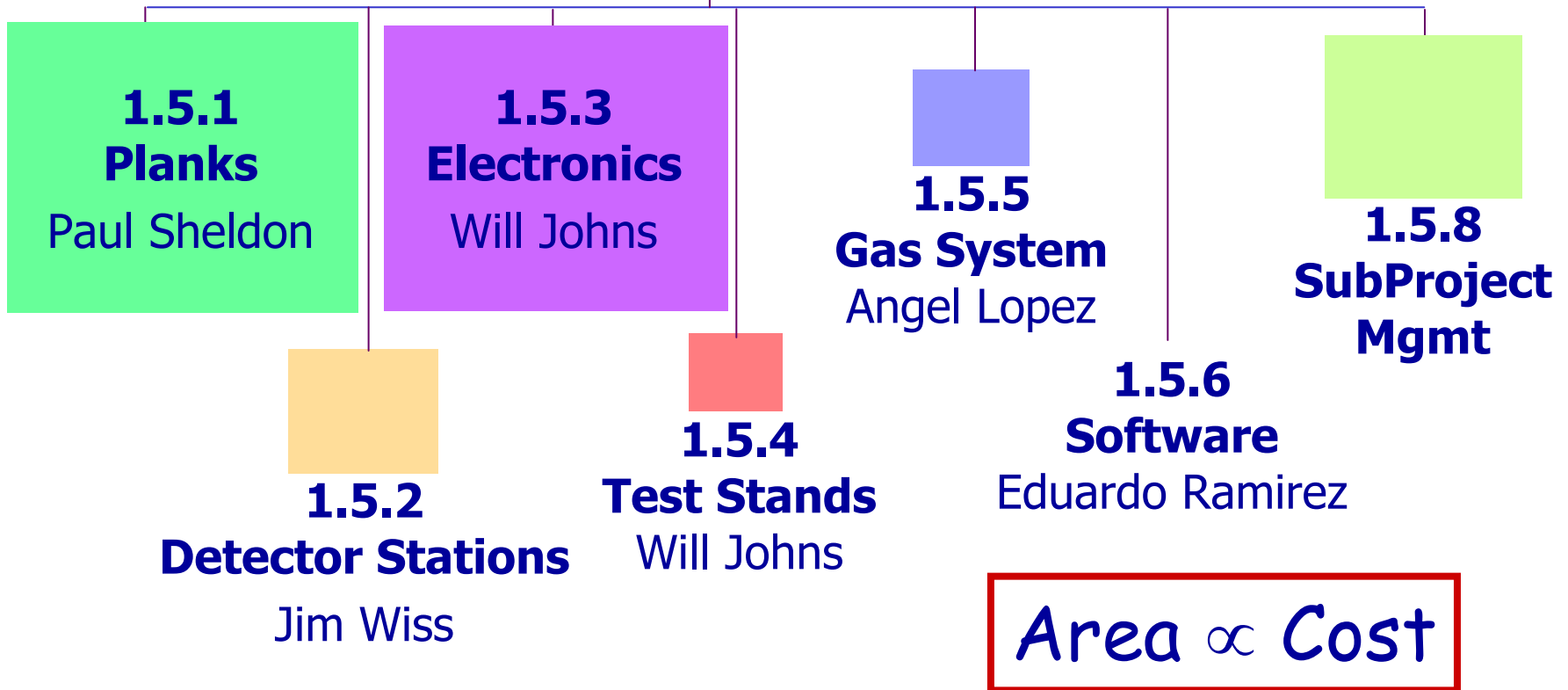
**Occupancies and rates are small even for 396ns
<n>=6 (3 times larger)**

Base cost: \$4.4M (M&S: \$3.2M, Labor: \$1.2M)



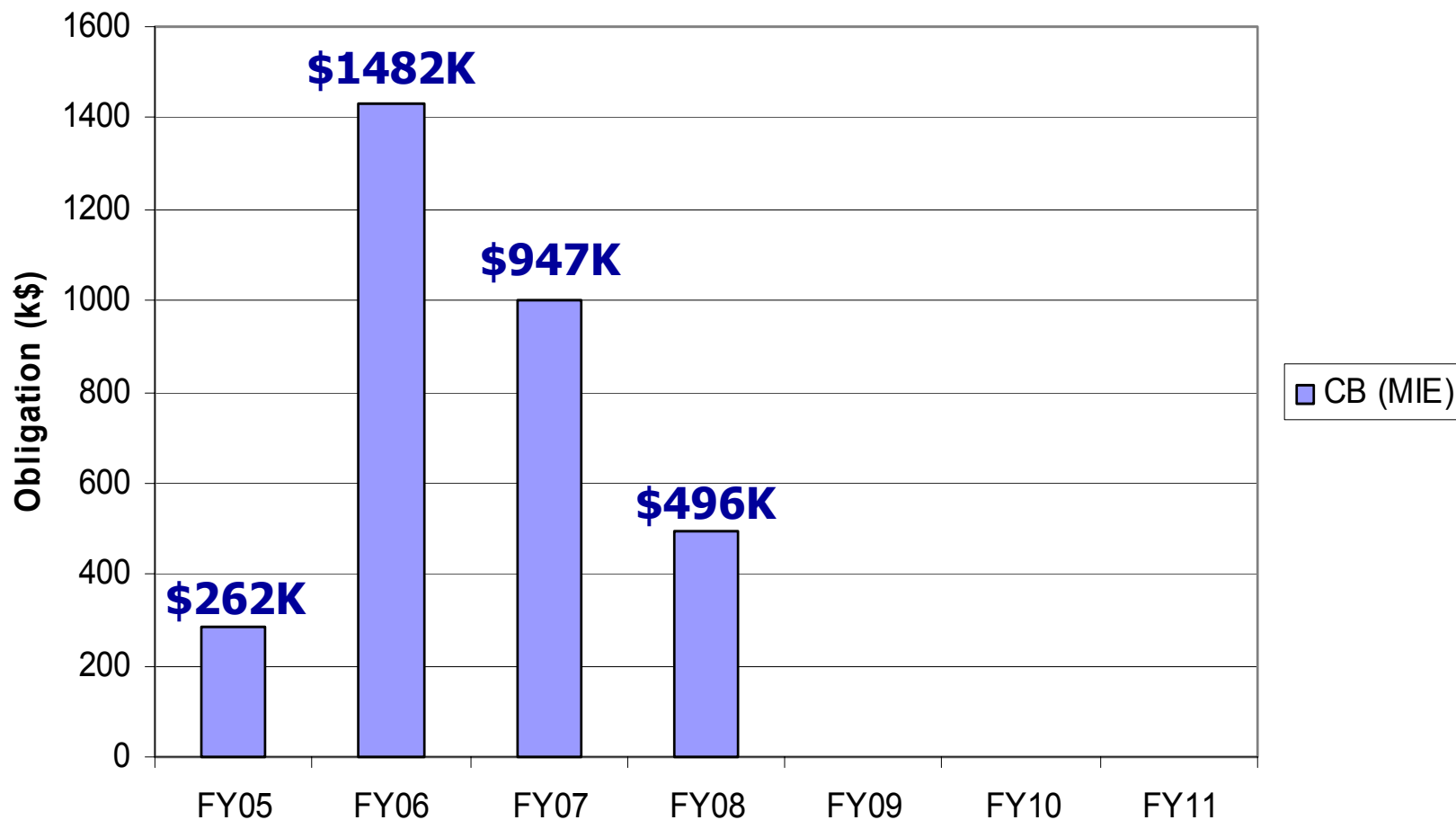
Base cost: \$4.4M (M&S: \$3.2M, Labor: \$1.2M)

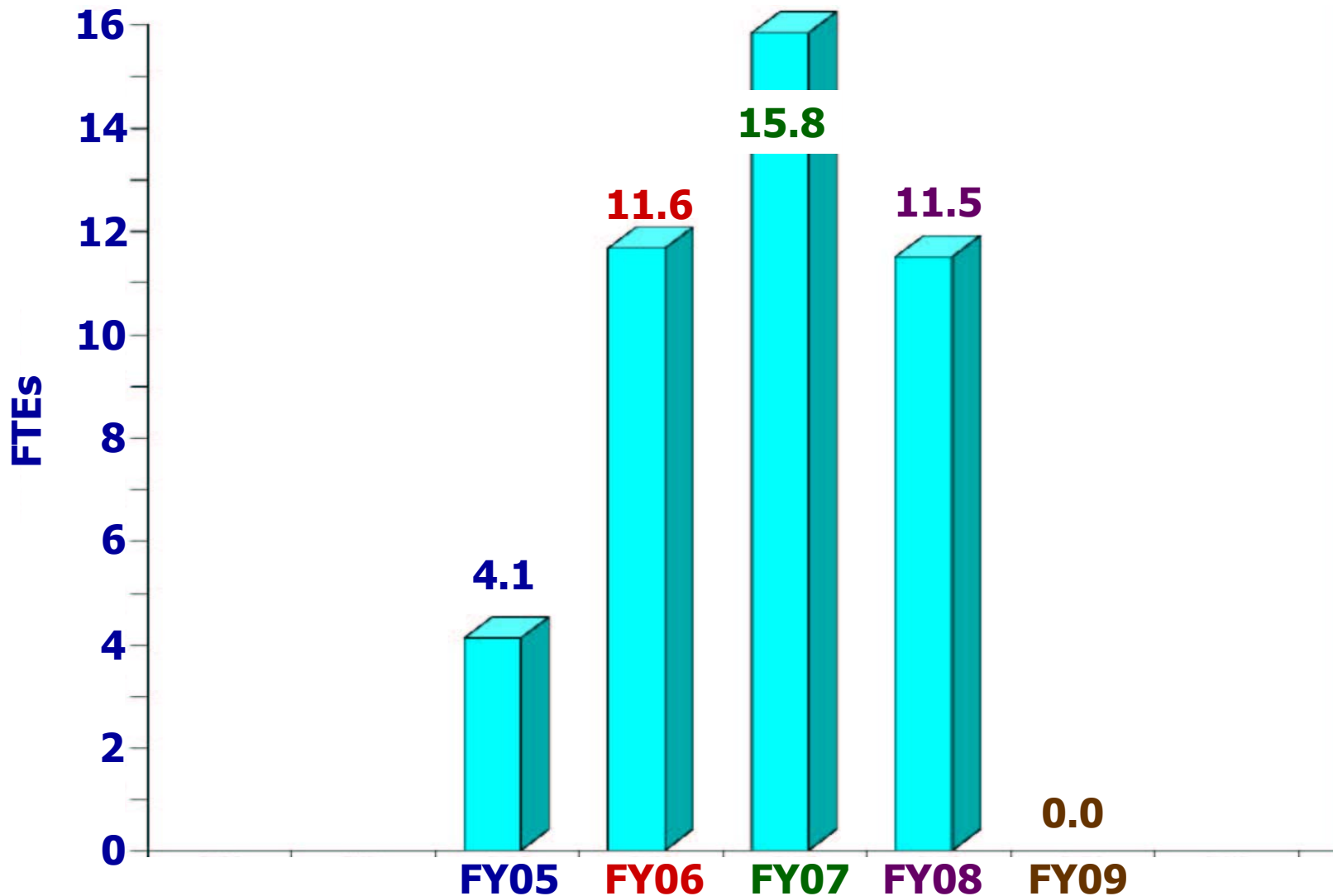
WBS 1.5 – Muon
Paul Sheldon

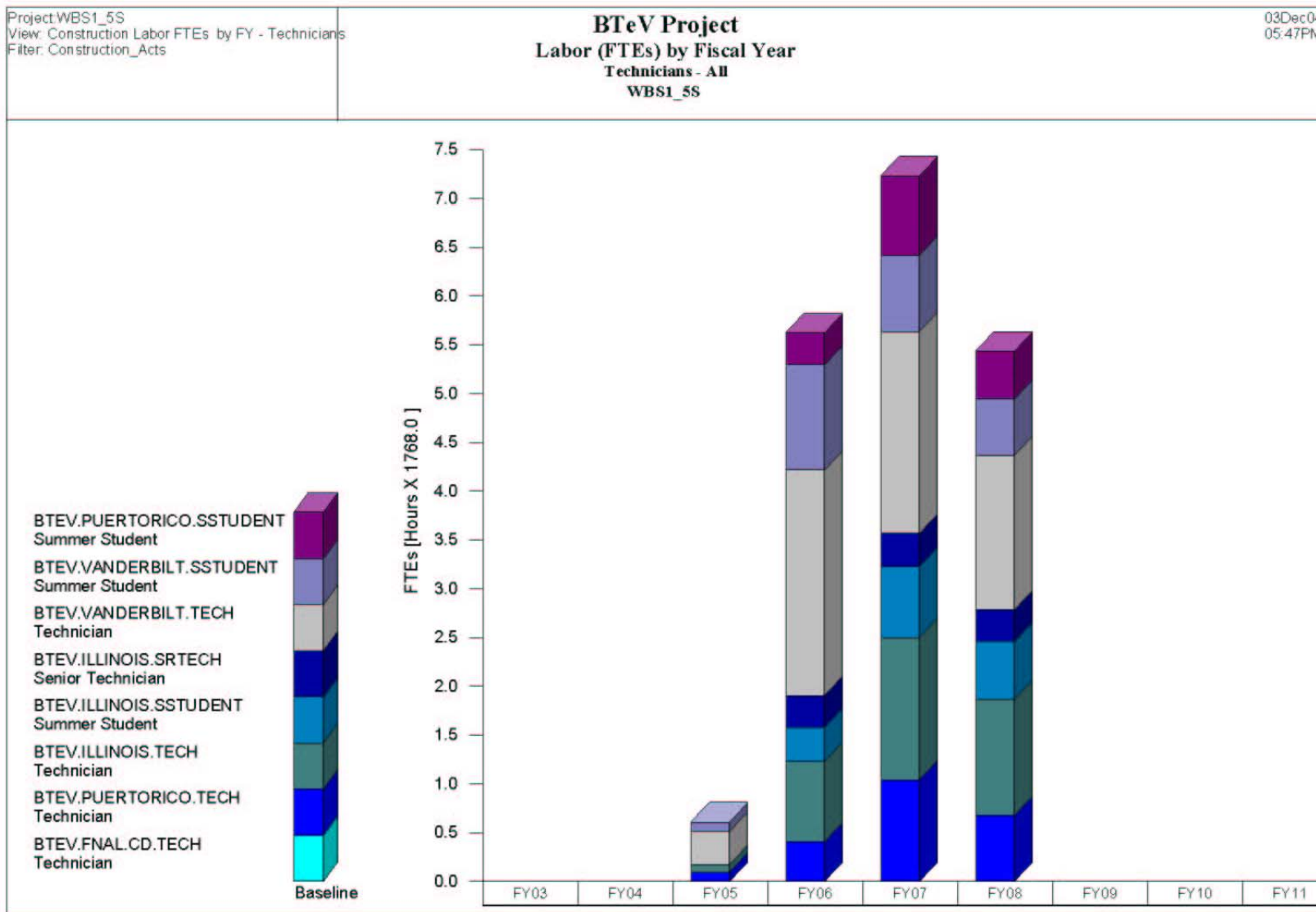


Activity ID	Activity Name	Base Cost (\$)	Material Contingency (%)	Labor Contingency (%)	Total FY05	Total FY06	Total FY07	Total FY08	Total FY09	Total FY10	Total FY05-10
1.5.1	Muon Detector Planks	1,788,686	43	35	203,104	908,305	1,054,901	354,960	0	0	2,521,269
1.5.2	Muon Detector Stations	350,771	40	35	63,436	246,290	136,397	41,013	0	0	487,136
1.5.3	Muon Detector Electronics	1,341,849	41	17	40,118	885,865	415,335	510,614	0	0	1,851,933
1.5.4	Muon Detector Test Stands	156,726	45	50	65,448	42,949	119,421	0	0	0	227,818
1.5.5	Muon Detector Gas System	121,319	50	0	0	106,050	66,903	0	0	0	172,953
1.5.6	Muon Detector Software	0	0	0	0	0	0	0	0	0	0
1.5.8	Muon Detector Subproj Mgmt	669,276	24	24	115,275	238,882	238,882	238,882	0	0	831,920
1.5	file_15_092104	4,428,627	41	28	487,380	2,428,341	2,031,839	1,145,468	0	0	6,093,029

WBS 1.5 Muon Detector M&S Obligation Profile



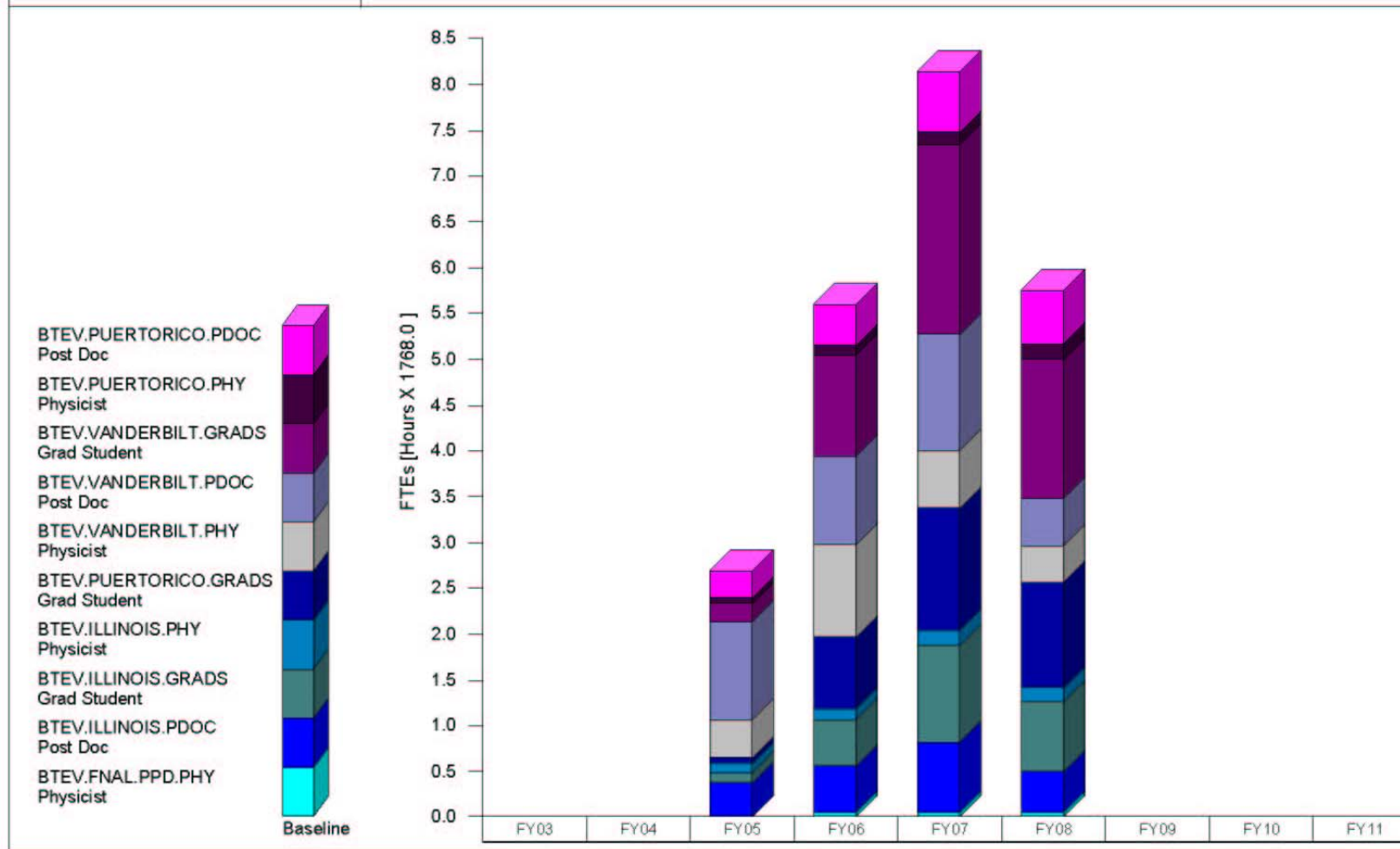


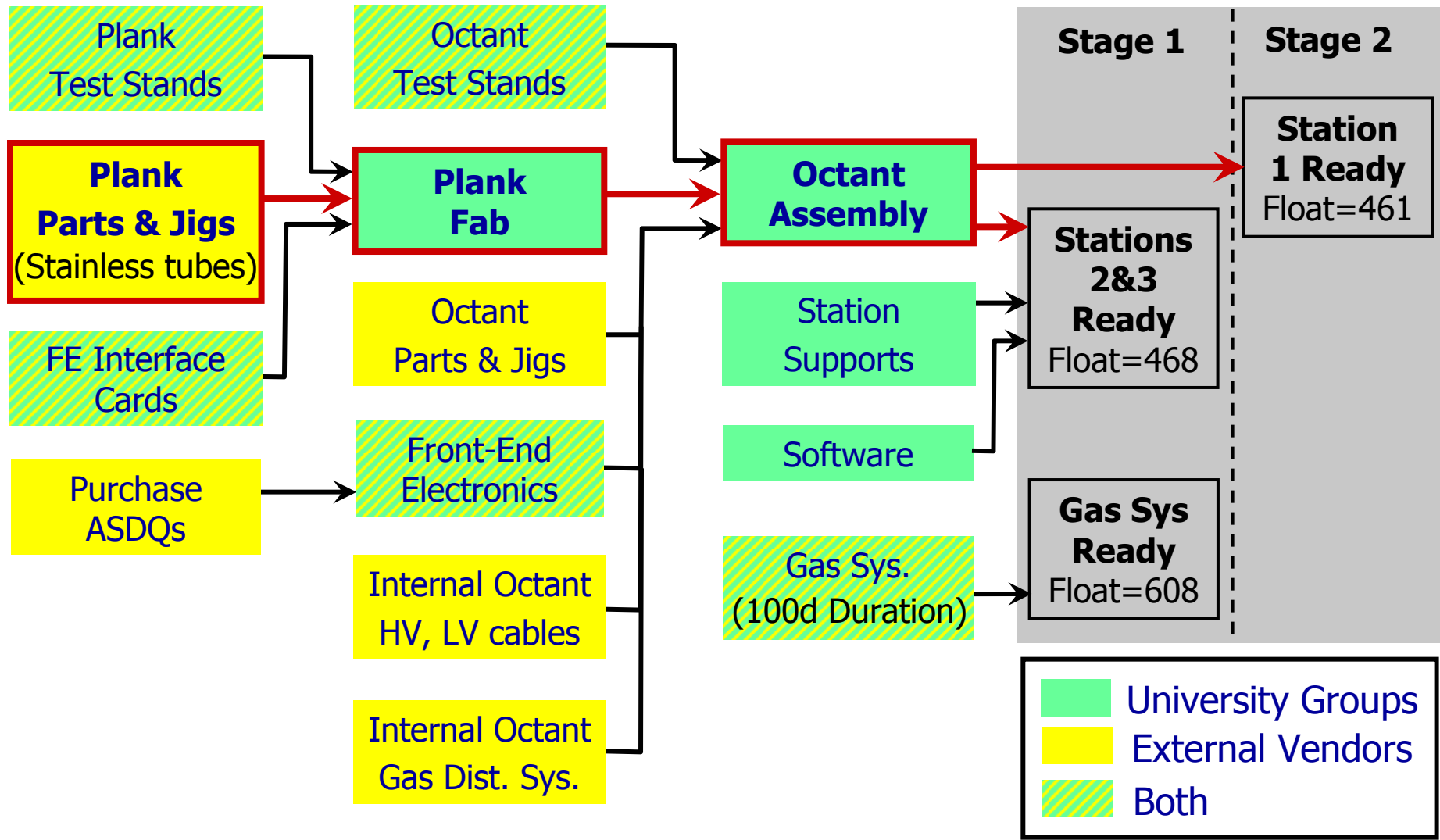


Project: WBS1_5S
View: Construction Labor FTEs by FY - Physicists
Filter: Construction_Acts

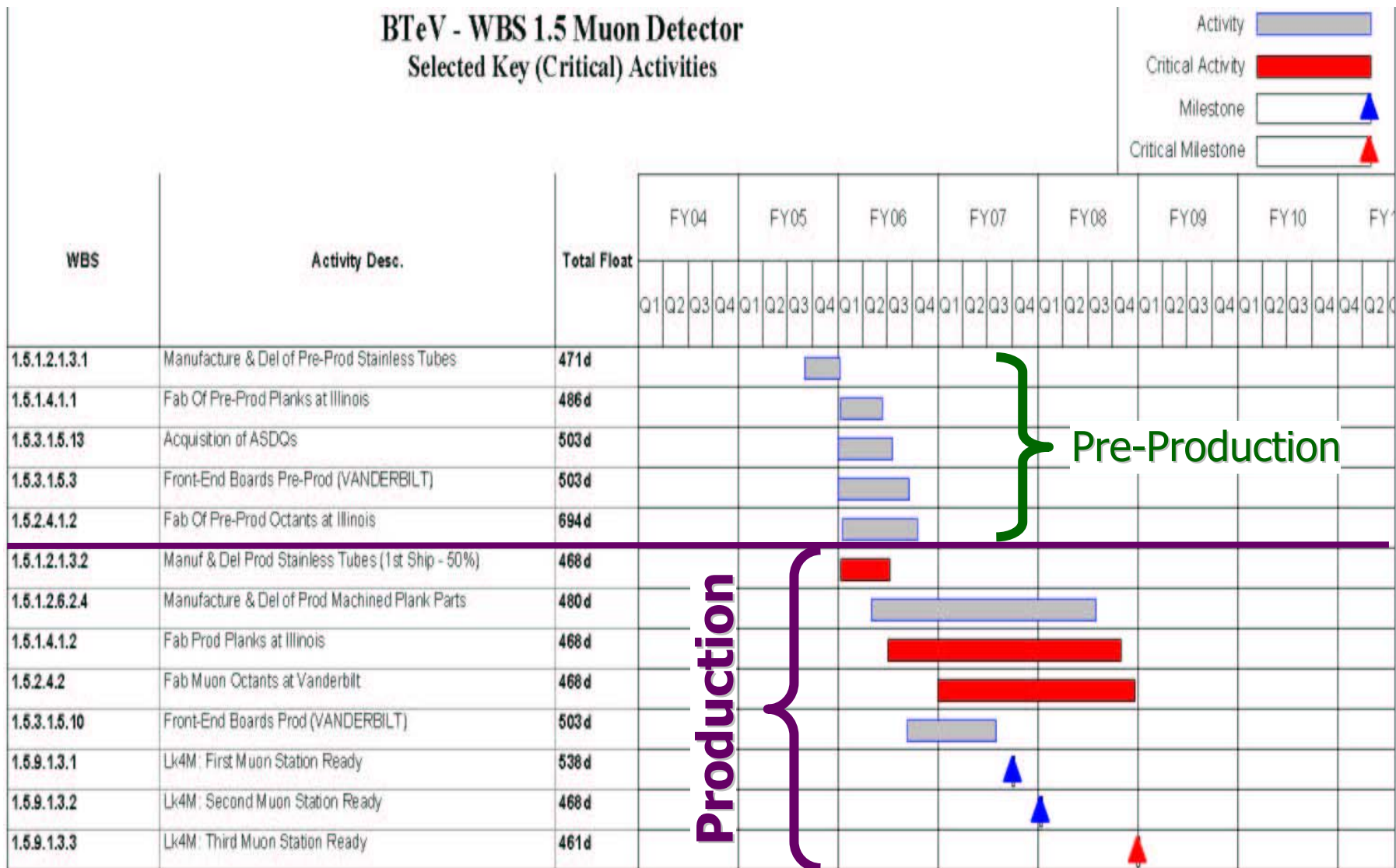
BTeV Project
Labor (FTEs) by Fiscal Year
Physicists - All
WBS1_5S

03Dec04
05:44PM





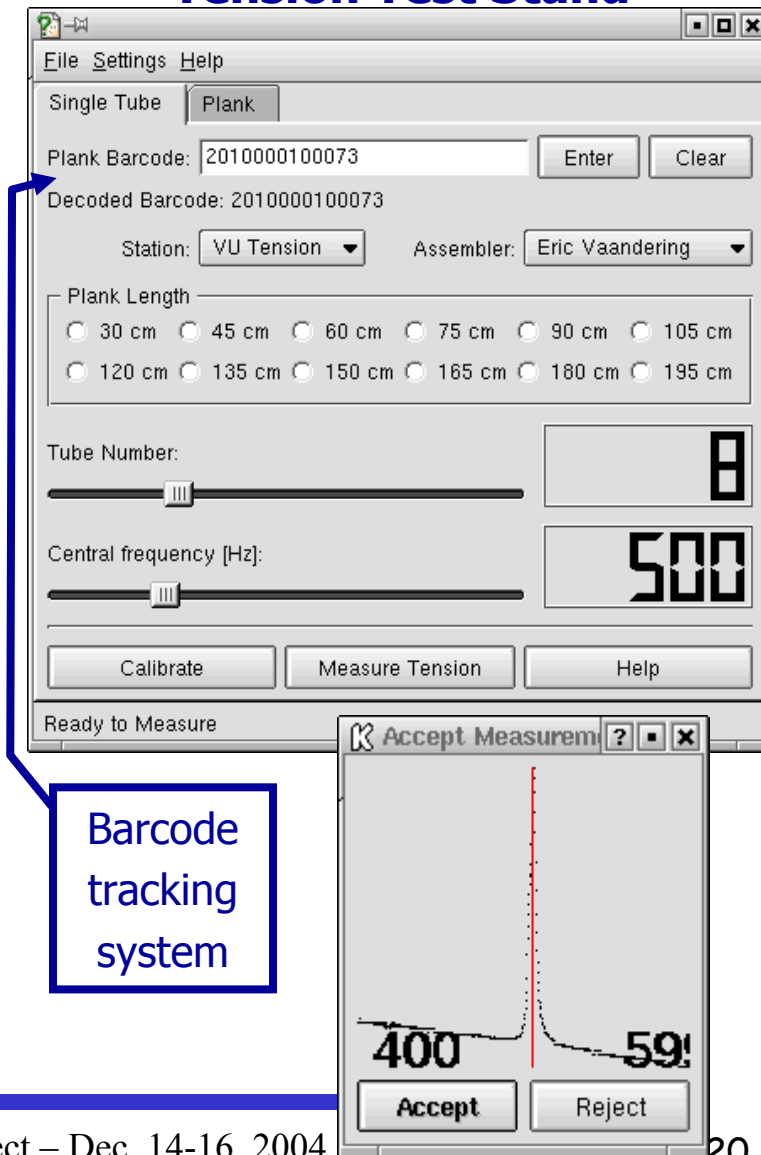
BTeV - WBS 1.5 Muon Detector Selected Key (Critical) Activities



- The primary recommendation was that we hire a full-time quality assurance engineer for the duration of the project.
 - After discussing this with project management, it was decided that additional effort will be added to the project office to handle QA issues for BTeV. The muon project will hire a full-time technician to handle QA and project oversight.
 - We have added this technician to our WBS
- Actively pursue forward funding.
 - Vanderbilt has verbally agreed to provide \$1M in forward funding. MOU is in preparation.

- We have significant experience w/ many of the steps necessary to build and install the muon system
 - Built roughly 2 dozen planks, *with student labor*
 - Designed, built and used many of the test stands that we will use in our quality assurance program (tension measurement, etc.)
 - Built a full scale model of one wheel, using it to investigate support and installation issues
 - During the past year, significant engineering on mechanical support structure, now have a well-developed design
 - We have a well-developed design for the Front-End electronics and we have verified its properties with prototypes

Tension Test Stand



- We have dealt with many of the vendors we will use
 - Vanderbilt shop has fabricated the parts it has to make
 - Stainless tube vendors, ...
 - Penn ASDQ's
- **The labor required is modest (43 FTEs) and well-matched to the size of the research groups already on-board.**
 - Physicist (“off-project”) labor reqd is already present in our groups
 - student labor required is not larger than is typically present in each of our groups
- **We have chosen a robust, easy to build, well understood detector technology and our studies indicate that it is well matched to our problem.**
 - This includes a well-developed and engineered design for the mechanical structure and support

The End

